Radial and Angular Correlations and the Classifications of intershell triply excited states

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We analyzed the radial and angular correlations of the fifty $2\ell 2\ell' 3\ell''$ triply excited states of atoms. Using hyperspherical coordinates we examined the channel functions in the body-fixed frame to identify the elmentary normal modes which characterize the correlated motion of the three electrons. For the intershell states, we showed that the angular correlations are identical to those in the $2\ell 2\ell' 2\ell''$ intrashell states and the three electrons perform bending vibrational mode akin to that of an XY_3 molecule with X representing the nucleus and Y the electron. However, additional "+" and "-" quantum numbers are needed to distinguish the symmetric or antisymmetric stretch of the outer electron with respect to the two inner core electrons, analogous to the "+" and "-" in describing intershell doubly excited states of a two-electron atom. These approximate quantum numbers allow us to reclassify all the 50 intershell states into different manifolds where the energy levels of the states within a given manifold show rotational structure resembling that of a symmetric top. The nature of the correlations and the rotational level structures of the intershell and intrashell states will be presented

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